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Adult education and information science can be viewed as aspects of the endeavor to communicate collective human knowledge and experience. Where self-learners "need to know" intersects with information and library science skills in meeting user needs, dynamic interaction may take place. Information systems research at Stanford University, Purdue, Lehigh, the Ontario Institute for Studies in Education, and elsewhere has been concerned with determining what is meant by satisfying user needs, clarifying objectively what those needs are, and building systems that meet those needs. (The document includes 13 references and an information services model.) (author/ly)

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MEETING USERS' NEEDS - WHERE ADULT EDUCATION AND INFORMATION SCIENCE INTERACT

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ABSTRACT

Where self-learners' "need to know" intersects with information and library science skills in meeting users' needs, dynamic interaction may take place. What is meant by "satisfying users' needs", clarifying objectively what those needs are and building information systems that meet those needs are the concern of information systems research.

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John Shearman

February 5, 1969

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MEETING USERS' NEEDS - WHERE ADULT EDUCATION AND INFORMATION SCIENCE INTERACT

When I was invited to submit a paper for possible presentation at this National Seminar on Adult Education Research, I immediately began to think of what common ground there might be between the apparently separate subjects of adult education and information science. Actually, it was perfectly natural for me to think in these terms, for at different times in my professional career, I have been engaged in both fields of endeavour. As I considered my experience as an adult educator, and my more recent experience as a librarian specializing in the development of new systems for information storage and retrieval, I came to the conclusion that adult education and information science must be considered as two parts of the same human experience. That experience has been variously described; but I think the word "communication" is perhaps the best definition of what I mean. This appears to be the best verbal 'umbrella' under which adult education and information science may be discussed as two aspects of the same reality, for surely we - adult educators and information scientists - are engaged in the pursuit of a common goal: the communication of collective human knowledge and experience.

Though adult education and information science may be two aspects of the same fundamental reality, we must separate them for purposes of analysis and academic discussion. This is the traditional approach of logical analysis and I see no reason to depart from it.

Each of these subjects may be likened to a mathematical quantity called "a vector". Webster defined a vector as "a quantity that has magnitude, direction,

and sense, and is commonly represented by a straight line." (Webster, 1967) If we draw in two straight lines proceeding in different directions, we can give one the name adult education and the other the name information science. If we continue each of these lines in a direction so that they will intersect, we have at the point of intersection something which I feel represents what I want to say to you in this paper today.

Now, if I may move from mathematical symbolism to the field of systems analysis, I would like to point out that each of these subjects, adult education and information science, may also be considered as a system. Robert W. Krueger has defined a system most succinctly in the following terms: "A system is an aggregation of components assembled and organized to produce a desired result. In the broad sense, the elements of a system are: equipment, procedures, and people." (Krueger, 1968) A.D. Hall, one of the pioneers of systems engineering in the Bell Telephone Laboratories, has defined a system in more theoretical terms as "a set of objects and their attributes and the relations between them." (Hall, 1968)

Though I feel that Krueger's definition is much easier to talk about informally, there are certain advantages in Hall's definition. The characteristics or attributes of the adult education system are variously conceived and defined by academic research. The same situation is true of the characteristics or attributes of the information science system. Perhaps the significant characteristic of adult education is the individual learner's need to know. As a librarian and information scientist, it is my understanding that the purpose of all information systems is to satisfy that learner's need.

Returning to our mathematical metaphor, at the point where the vectors intersect, information systems meet users' needs. At this point of intersection, it is possible for a dynamic process of interaction to take place. What is the nature of this interaction between adult education and information science?

As many of you know, Dr. Allen Tough, the chairman of the Planning Committee for this Seminar, is conducting some long term research on adult learning

projects. (Tough, 1967, Adult Learning Projects) Some of the questions which he is asking in this research program, and some of the answers which his own research has already discovered are of considerable significance to us as information scientists as well as for adult educators. He has asked, for instance, how frequently does each of the following experiences occur:

1. The learner fails to obtain the desired particular resource.
2. The learner fails to obtain the desired type of help from a particular resource.
3. A learner obtains a desired amount or sufficient amount of the type of help sought.
4. The learner receives important help without seeking that type of help or that particular resource.

Tough is also asking such questions as "What are the effects of each of the above events on the learner's future help-seeking behaviour during the same learning project? For example, one possible effect of a learner failing to obtain a desired type of help from a particular resource is that the learner resolves he will never again seek help from that type of resource." Again, Tough asks why does a learner stop seeking help in general, a specific type of help or help from a particular resource. For example, does a learner sometimes decide to abandon his effort to obtain a certain type of help because the effort if continued would cost him more time than the help could save?

In his study of tasks and assistance during adult self-teaching projects, Learning Without a Teacher, (Tough, 1967) Tough discovered that in a group of 40 college graduated self-learners, librarians rank lowest of seven types of helpers in each of four measures of assistance tasks. For these particular self-learners, a librarian was the least likely person for a self-learner to turn to for help in their particular learning project.

As a librarian, I react to this with dismay. Yet quite recently, I had the interesting experience of having my fourteen-year-old son, a student in grade nine, find a very useful book for me to learn some intricate details about home

electrical wiring. Three different public libraries were not able to give me the help I required.

On the other hand, it would be quite unfair for me to leave you with the impression that all libraries fail to fulfil the information needs of their clientele. Let us avoid the shrill confrontation and mutual condemnation of extremist positions. The meeting of users' needs is not a simple case of either complete success or complete failure. In the January 1969 issue of the Wilson Library Bulletin (Williams, 1969), there is a delightful story of a mother who suggested with some misgivings that her twelve-year-old son try to find out from the information service of the Minneapolis Public Library the exact won-loss percentage of the Minnesota Twins. When she asked him about the attitude of the library staff member who had promptly provided him with the desired data, he nonchalantly replied, "She sounded used to it."

Let me reiterate that I welcome this particular opportunity to interact with adult education researchers because I feel that the questions being raised by some of your research has tremendous implications for us who are in the library and information science profession. The great problem we are challenged by today is what it means to have at our finger tips an incredible volume of useful information and not to be able to make it more available to people who can use it.

Leaving the practical problem of meeting particular users' needs aside, information science must turn its attention to what may be more theoretical concerns. I assure you, however, that though these concerns may appear to be theoretical, they are vital issues in the developing of information systems adequate for meeting the information needs of the self-learners. Two questions seem to require primary consideration.

1. What do we mean by "satisfying a person's need to know"?
2. How do we clarify users' needs objectively so that we can create information systems which actually do interact with users?

John O'Connor, of the Center for Information Science at Lehigh University

in Bethlehem, Pennsylvania, has suggested that there are three meanings to this phrase "satisfying a person's need to know". First, it means to provide a document that answers the subject request. Secondly, it means that we give a user "information that will help his work". Thirdly, he says that "after some request negotiation, cross-referencing or search cycling, (we give the user) documents he is glad to get".

As a computer-oriented information scientist, O'Connor may be striving for the most accurate, quantifiable definitions possible. In a discussion of his work at the 1968 Annual Convention of the American Society for Information Science, several speakers emphasized that the question of satisfying a person's need to know could not be reduced to the quantitative objectivity which he appeared to demand. The reason for this is obvious. Satisfaction is a highly subjective experience. People are highly complex and highly subjective in their approach to any search for information. Finally, a person's need cannot be defined in neat mathematical terms.

In responding to O'Connor's paper, F.W. Lancaster, of the National Library of Medicine (Lancaster, 1968), has said that he always regarded the meaning of the phrase "satisfying a person's need to know" as self-evident. He added that he personally is "concerned with some type of literature-searching service in a particular document collection to a particular group of users". In other words, there are very specific constraints within which any information system operates in response to the user inquiries. Lancaster further points out that there are those who believe that a retrieval system exists only to provide what it is asked to provide. He emphasizes quite appropriately, however, that an information system that is merely satisfied with "matching stated requests" is really falling down in its responsibilities to its clientele.

As one of those engaged in the discussion with John O'Connor about the meaning of this phrase "satisfying a person's need to know", I confess that I hold to the conviction that a learner's need is very complex. As a librarian, however, I think it only fair to point out that there are serious blocks to communication

between users and information systems without which the needs of users cannot be expressed and cannot be met. Calvin Mooers somewhat cynically stated the same truth a number of years ago in what is known in information science as Mooers' Law. He felt that since "ignorance is bliss, it is often more painful and troublesome to have information than to do without it." (Shera, 1966) In formal words, Mooers' Law may be defined as "the utility of an information system may be said to vary inversely to its efficienty".

Lest I seem to be damning my own profession, let me hasten to add that there are a great many librarians who recognize the need of information systems, including their operators, the librarians, to have a new concept of disseminating information, rather than seeing their function merely as custodians and controllers of information resources. In short, libraries are changing. They have been changing for a long time now; and the changes will continue apace. The mental image many people have of libraries and librarians is a ridiculous caricature. I wish I could help to dispel any such misconceptions which may be in your minds by introducing you to some of my charming associates at the Library of the Ontario Institute for Studies in Education.

In discussing the second of the above questions, users' needs must be clarified so that objective appraisal of the interaction between users and systems is possible. Robert S. Taylor, formerly of Lehigh University Center for Information Sciences, and now director of the Library at Hampshire College, Amherst, Massachusetts, has defined an enquiry as a description of an area of doubt in which a question is open-ended, negotiable and dynamic. (Taylor, 1968) He believes that there are four levels of question formation: first, the unconscious need of the enquirer; second, the conscious need; third, the formalized need; and fourth, the compromised need. Taylor holds that there are five filters through which a question passes in being negotiated from the unconscious need to the compromised need which is finally answered by the information system. These five filters are: first, determination of the subject; second, the objective and motivation of the seeker; third, the personal characteristics of the enquirer;

fourth, the relationship of the enquiry description to the file organization; fifth, the anticipated or acceptable answers to the query.

On the basis of what little experience I have had at a reference desk in an academic library, and also as a result of my study of the reference records of the questions asked at the Library of the Ontario Institute for Studies in Education, I am in full agreement with Taylor's description of question-negotiation in the process of information seeking. Any reference librarian will tell you that in all probability the first question asked by an enquirer is not really the question that he or she wants answered, and that a delicate process of negotiation - a genuine process of problem-solving - is required in order for a reference librarian to provide an enquirer with the information which he actually seeks.

Edwin B. Parker, of the Stanford Institute for Communications Research, has made an interesting study of information retrieval systems as "receiver-controlled communication systems". (Parker, 1966) As a result of his investigation, he believes that information needs, information seeking and information processing behaviour of scientists should be a subject of considerable psychological research. "Such psychological research is required to provide adequate specifications for systems designers and adequate criteria for the evaluation of systems", he says. Parker adds three caveats to his discussion of information storage and retrieval systems. First, information systems provide only what is stored; that is, they are source controlled. Secondly, it is unnecessary to provide accommodation for all idiosyncrasies of the search behaviour of every enquirer. Third, scientists, being people, are quite adaptable, including adaptative to highly sophisticated new communication systems.

The user is the most complex component of an information system. T.B. Yerke, Librarian of the Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, Berkeley, California, has pointed out with good reason that putting the user at the center of the information system introduces a variable which can be ignored only at the cost of lowering a system's efficiency. (Yerke, 1968) Yerke states that in traditional information

system, enquiries are carried out entirely in conversation (he calls it "the semantic mode"). Person-to-person communication is of vital importance in the seeking of information among scientists and other professionals. Many a scientist who wants to know something may phone a friend 2,000 miles away. He may also go down two floors to the library or telephone the reference desk for the information he requires. If we reach the age of totally machine-based information systems, the semantic mode of information transactions would no longer be possible. It would be necessary to translate enquiries into entirely symbolic statements which, from the system point of view, are wholly quantitative. Why? Because computers are nothing more than giant adding machines operating at almost incredible speed! To quote Yerke again: "The system is incapable of the slightest semantic reaction".

That day has not arrived, and for the unforseeable future, we will be continuing to acquire information in the semantic mode. But users tend to resist formal acquaintance with information systems, as Calvin Mooers and numerous others have pointed out. Yerke concludes that "If good system design can increase the pay-off of user acquaintance with the system, then we can make at least operational progress to increase users' satisfaction".

So we come full circle to the problem of creating information systems which actually do interact with the needs of users. Such systems may be regarded as adaptive systems; that is, they have the ability to react to their environment in a way that is favourable in some sense to the continued operation of the system. An adaptive system maintains stability among all those variables which influence its operation.

Baker and Nance, in a study carried out at Purdue University (Baker and Nance, 1968) have stated that an information storage and retrieval system is a sub-system within a larger system which includes the users and the funders of the retrieval system. These three components, users, the information system and the funders form a closed-loop information feedback system in which user response influences both the funding and the operation of the system as it attempts to

satisfy users' needs within a limited budget allocation. Those of us who work within the academic community with its finite resources have no difficulty in understanding exactly what Baker and Nance mean. They have also applied their simulation model to university departmental libraries at Purdue, and are at present engaged in extending their studies to a much larger information retrieval system. Figure I is a reproduction of their model.

At the Ontario Institute for Studies in Education Library, we have undertaken a research project which we anticipate will lead us in the direction of establishing information systems, or sub-systems, to be more accurate, which will adequately serve the needs of our academic departments and research staff. Our present research project proposes to study the information needs of three of our academic departments including some 50 academic and research supporting staff, to 60 full time graduate students and 150 part time graduate students. Our plan is to carry out structured interviews with the academic and research supporting staff, and to circulate a questionnaire among the more than 200 students in the three departments concerned. One of these is the Department of Adult Education. Briefly, our purpose is to create an information system that is adaptive to actual needs of its users and distributive in its handling of information. In doing so we shall try:

1. To discover some of the information needs demonstrated by three OISE departments.
2. To define the library services required to meet these needs.
3. To analyze library services as systems.
4. To engage the library staff in research so that the development of such an adaptive information system is the result of creative communication between the users and the system operators.

The hypothesis on which we are basing this study is that some information needs of OISE academic departments are such that the library systems required to meet these needs must be a particular combination of services as provided in academic libraries, special libraries and technical information centres.

We do not feel that this project is anything more than a short, halting step into the future development of user-oriented information systems. We are convinced, however, that greater awareness of our users' needs will enable us to make more precise administrative decisions concerning the kind of services which our library ought to be providing. At a later date, we hope to extend our investigation to other known needs of our clientele, we may be able to increase the measure of users' satisfaction. We enter this research project with the conviction that our goal is not an entirely vain dream.

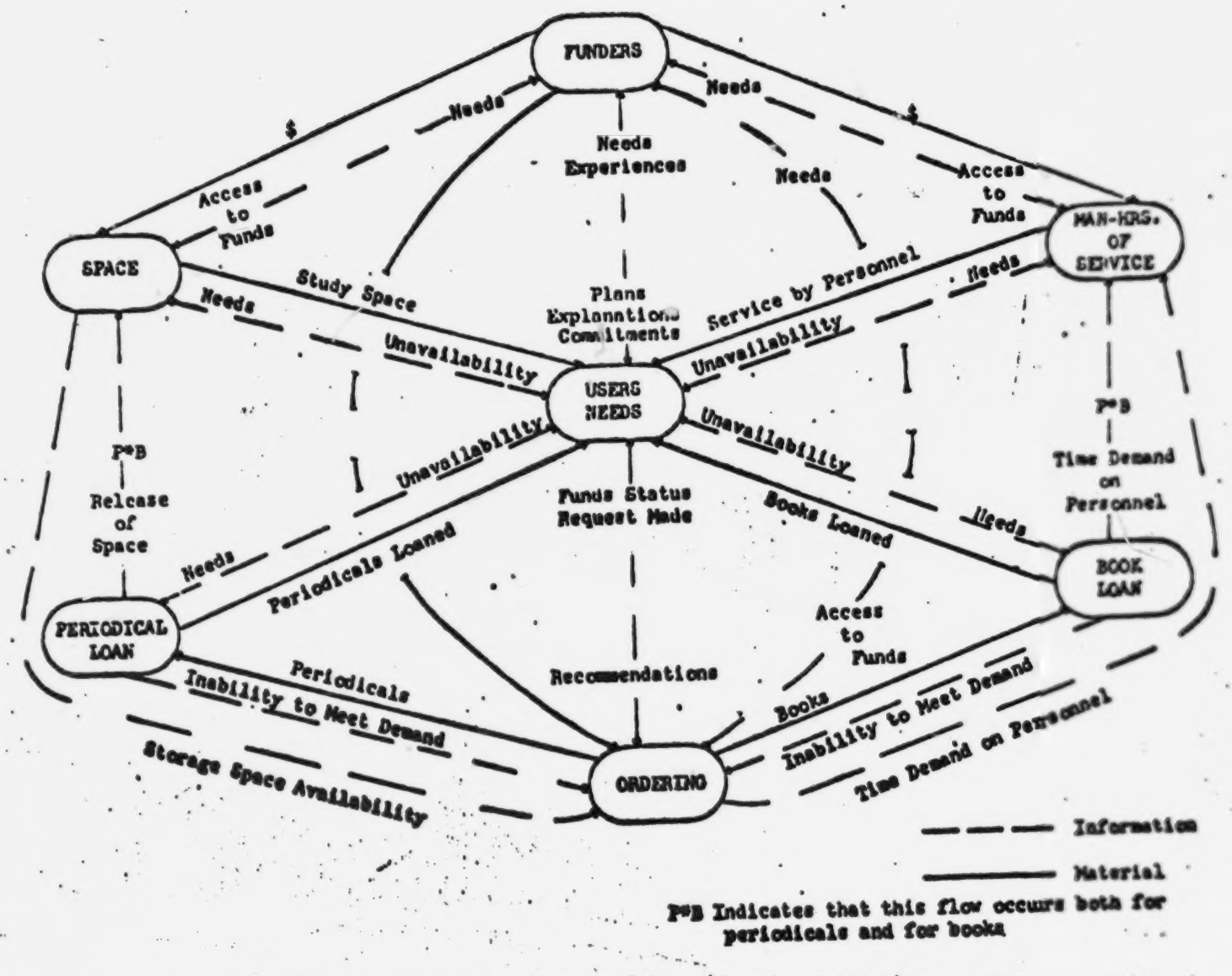

FIG.1. Model of library/user/funder complex.

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